

REMARKS

Initially, Applicant would like to express his appreciation to Examiner Phan for the courtesies extended to Applicant's attorney during a telephone interview on May 25, 2004. During the interview, Examiner Phan agreed with Applicant's attorney that the Meli reference teaches a filter used for wavelengths within the same optical transmission band, rather than for wavelengths within two different optical transmission bands as in Applicant's claimed invention. Examiner Phan agreed to reconsider Applicant's application.

Claims 1-9, 12-16, 18, and 21-31 are pending in the application. Applicant respectfully requests additional consideration and review of the claims in view of the following remarks.

Claim Rejections Under 35 U.S.C. §103 (a)

The Examiner has rejected claims 1-9, 12-16, 18, 21-31 under 35 U.S.C. § 103 (a) as being unpatentable over various references. Applicant respectfully traverses this rejection.

As stated in the prior amendment, an important aspect of Applicant's claimed invention is the use of an optical filter that is transmissive to signals of one optical transmission band traveling in a first direction to one transport path and reflective to signals of a second optical transmission band traveling in an opposite direction to a separate transport path, as indicated, for example, at page 4, line 6 through page 5, line 10 in Applicant's specification. In addition, optical filters corresponding to particular optical transmission bands are placed in an alternating arrangement. This technique provides signal separation and much lower insertion loss than other techniques.

Claim 1 points out this important aspect of Applicant's claimed invention at, for example, lines 25-26 that states "*wherein said first optical filter and said second optical filter are in an alternating arrangement.*"

Claim Rejections Under Sakamoto and Meli

Claims 1, 2, 12-13, 21, 23, and 25-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakamoto et al. (U.S. 6,490,064) in view of Meli (U.S. 5,995,259). Sakamoto provides a bi-directional system with two oppositely directed set of signals converging on an optical filter, as shown in Sakamoto's Figures 16 and 18, and mentioned in column 13, lines 16-39 and column 13, lines 58-64 of Sakamoto's specification. The oppositely directed set of signals is within two different optical transmission bands.

Meli provides a bi-directional system with two oppositely directed signals converging on an optical coupler. The two oppositely directed signals are within the same optical transmission band (i.e., 1530 to 1563 nm).

In the Office Action, the Examiner contends that it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the arrangement of the optical coupler disclosed in Meli in the system disclosed by Sakamoto. Applicant respectfully submits that there is no motivation to combine the teachings of Sakamoto and Meli and even if the cited references could be combined, the resulting combination would not embody Applicant's inventive teachings nor render Applicant's claims obvious.

First, as stated in the Office Action, the Examiner agrees that Sakamoto does not teach Applicant's claim 1 limitation calling for "wherein said first optical filter and said second optical filter are in an alternating arrangement".

Second, the bi-directional system described by Meli supports a first wavelength of 1533 nm and a second wavelength of 1556 nm, as stated in column 5, lines 20-24. These wavelengths are in the optical transmission band known as C-band. Meli discloses a bi-directional amplifier with an amplifying wavelength band inclusive of the same first and second wavelengths. (See FIG. 6 and column 9, lines 28-35) Also, Meli discloses a first optical coupler designed to allow a signal in the first wavelength to pass and reflect a signal of the second wavelength. And, Meli discloses a second optical coupler designed to allow a signal in the second wavelength to pass and reflect a signal of the first wavelength. However, contrary to Applicant's claim 1, Meli's optical couplers

support only one optical transmission band (i.e., C-band) rather than two different optical transmission bands (e.g., C-band and L-band). The operation of the optical couplers in Meli within the single wavelength band is required because all signals must be within the amplifying wavelength band (i.e., gain bandwidth) of the bi-directional optical amplifier (i.e., the C-band amplifier). Therefore, Meli doesn't teach or suggest optical filters (couplers) in an alternating arrangement that support two different optical transmission bands, e.g., C-band and L-band.

In view of the foregoing, there is no motivation to combine the teachings of Sakamoto and Meli. One would not be motivated to use Meli's "alternating" coupler arrangement in Sakamoto's system because Meli's coupler arrangement is only for single wavelength band operation and Sakamoto's system operates in two wavelength bands. Therefore Meli's coupler arrangement could not support the bi-directional transmission in two wavelength bands as required by Sakamoto. As such, substitution of the coupler arrangement from Meli into Sakamoto's system would render the invention being modified (i.e., Sakamoto's system) unsatisfactory for its intended purpose, which is to operate bi-directionally in two wavelength bands. Since the proposed combination of Sakamoto and Meli would change the principle of operation of Sakamoto, then the teachings of the references are not sufficient to render the claims prima facie obvious. One skilled in the art would therefore not have been motivated to substitute the coupler arrangement in Meli in the system disclosed by Sakamoto.

Furthermore, even assuming there was motivation to combine (which Applicant does not believe to be the case), combining Sakamoto with Meli still would not embody Applicant's claimed invention. Applicant's claim 1 calls for "said first optical filter being substantially transmissive to optical signals of said first band entering said input port and exiting on said bi-directional input/output port and said first optical filter being substantially reflective for signals of said second band ... wherein said first optical filter and said second optical filter are in an alternating arrangement". As stated, Meli's optical couplers are disclosed to support only a single optical transmission band (i.e., C-band). And, neither Sakamoto nor Meli, even when combined, supports alternating arrangements of

optical filters that correspond to two different optical transmission bands, as claimed by Applicant in independent claim 1. These distinctions are sufficient to distinguish Applicant's claims 1 from the combination of Sakamoto and Meli.

Since claim 2 depends from claim 1, this dependent claim is therefore also believed to be allowable for the same reasons set forth above for independent claim 1. Therefore, the Sakamoto and Meli combination does not embody Applicant's claim 2.

Independent claims 12, 21, 23 and 28 have limitations similar to that in independent claim 1. The Sakamoto and Meli combination does not properly teach those limitations previously discussed for the above-mentioned reasons. Since claim 13 depends from claim 12, claims 25-27 depend from claim 23, and claim 29 depends from claim 28, these dependent claims are therefore also believed to be allowable for the same reasons set forth above for independent claim 1. Therefore the Sakamoto and Meli combination does not embody Applicant's claims 12, 13, 21, 23, and 25-29.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 103(a) rejection of claims 1, 2, 12-13, 21, 23, and 25-29.

Claim Rejections Under Islam and Meli

Claims 23-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Islam (U.S. 6,631,028 B1) in view of Meli (U.S. 5,995,259). Islam provides broadband amplifiers and communication systems for S-band, C-band, and L-band optical signals. However, Islam does not teach or suggest the limitation in Applicant's independent claim 23 calling for "wherein said means for filtering is adapted to be coupled in an alternating arrangement to a second means for filtering, said second means for filtering being substantially transmissive to said signals in said second signal band and substantially reflective to said signals in said first signal band". Nor does Islam teach or suggest the limitation in Applicant's independent claim 28 calling for "wherein said optical filter is adapted to be coupled in an alternating arrangement to a second optical filter, said second optical filter allows said signals in said second

signal band to flow onto said transport medium and reflects said signals in said first signal band".

As previously described, the bi-directional system described by Meli supports a first wavelength of 1533 nm and a second wavelength of 1556 nm, in the optical transmission band known as C-band. Contrary to Applicant's claims 23 and 28, Meli's optical couplers support only one optical transmission band (i.e., C-band) rather than two different optical transmission bands (e.g., C-band and L-band). Consequently, Meli doesn't teach or suggest optical filters (couplers) in an alternating arrangement that support two different optical transmission bands, e.g., C-band and L-band.

Combining Islam with Meli therefore would not embody Applicant's claimed invention. In particular, the combination of Islam and Meli does not teach or suggest "wherein said means for filtering is adapted to be coupled in an alternating arrangement to a second means for filtering, said second means for filtering being substantially transmissive to said signals in said second signal band and substantially reflective to said signals in said first signal band", as recited in Applicant's claim 23. As stated, Meli's optical couplers are disclosed to support only a single optical transmission band (i.e., C-band). Accordingly, neither Meli nor Islam, even when combined, supports alternating arrangements of optical filters that correspond to two different optical transmission bands, as claimed by Applicant in independent claims 23 and 28. These distinctions are sufficient to distinguish Applicant's claims 23 and 28 from the combination of Islam and Meli.

Since claims 24-27 depend from claim 23, and claims 29-30 depend from claim 28, these dependent claims are therefore also believed to be allowable for the same reasons set forth above for independent claims 23 and 28. Therefore, the Islam and Meli combination does not embody Applicant's claim 24-27 and 29-30.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 103(a) rejection of claims 23-30.

Claim Rejections Under Sakamoto, Meli and Kakui

Claims 3, 18, 22, 24 and 30 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sakamoto et al. (U.S. 6,490,064) in view of Meli et al. and further in view of Kakui (U.S. 6,549,315). The Sakamoto and Meli combination does not teach or suggest the limitations recited in Applicant's independent claims 1, 12, 21, 23, and 28 for the above-mentioned reasons. Kakui does not cure the deficiencies noted above for the Sakamoto and Meli combination. Since claim 3 depends from claim 1, claim 18 depends from claim 12, claim 22 depends from claim 21, claim 24 depends from claim 23, and claim 30 depends from claim 28, these dependent claims are therefore also believed to be allowable for the same reasons set forth above for the respective independent claims. Therefore, the combination of Sakamoto, Meli and Kakui still does not embody Applicant's claims 3, 18, 22, 24 and 30.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 103(a) rejection of claims 3, 18, 22, 24 and 30.

Claim Rejections Under Sakamoto, Meli and Alexander

Claims 4-7, 14 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sakamoto et al. (U.S. 6,490,064) in view of Meli et al. and further in view of Alexander et al. (U.S. 6,233,077). The Sakamoto and Meli combination does not teach or suggest the limitations recited in Applicant's independent claims 1, 12, 21, 23, and 28 for the above-mentioned reasons. Alexander does not cure the deficiencies noted above for the Sakamoto and Meli combination. Since claims 4-7 depend from claim 1 and claims 14-15 depends from claim 12, these dependent claims are therefore also believed to be allowable for the same reasons set forth above for the respective independent claims. Therefore, the combination of Sakamoto, Meli and Alexander still does not embody Applicant's claims 4-7, 14 and 15.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 103(a) rejection of claims 4-7, 14 and 15.

Claim Rejections Under Sakamoto, Meli, and Alexander

Claims 8, 9, 16 and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sakamoto et al. in view of Meli et al. and further in view of Alexander et al. (U.S. 6,281,997). The Sakamoto and Meli combination does not teach or suggest the limitations recited in Applicant's independent claims 1, 12, 21, 23, and 28 for the above-mentioned reasons.

The Examiner has cited Alexander for disclosing the use of thin film filters. In the Office Action, the Examiner contends that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Alexander's teachings to the Sakamoto and Meli combination. Applicant thus understands it to be the Examiner's position that it would have been obvious to modify the proposed Sakamoto and Meli combination to include the thin film filters from Alexander. Applicant respectfully submits that the teachings in Sakamoto and Meli provide no basis to conclude that a person of ordinary skill would think that Alexander's use of thin film filters could be used to facilitate Sakamoto and Meli's methods of optical transmission, thereby arriving at the subject matter of claim 1.

First, the problems that the references address are so different that the teachings provide no motivation for the person of ordinary skill to combine these references. Sakamoto solves problems associated with increasing the permissible optical input power to a dispersion-shifted fiber in a wavelength division multiplexing transmission system. Meli solves the problem of bi-directional amplification of optical signals using filters to eliminate internal reflections of the propagating signals within the amplifier. Rather than solving problems that involve increasing power to a dispersion-shifted fiber as done by Sakamoto and bi-directional amplification of optical signals as done by Meli, Alexander is concerned with channel detection and minimizing power loss in optical networks. Specifically, Alexander solves the problem of providing a multiplexer and demultiplexer for a dense wavelength division multiplexing system that minimizes power loss and enables detection of transmitted channels. How would the person of ordinary skill be motivated to combine a solution that

teaches increasing power to a dispersion-shifted fiber with another that teaches bi-directional amplification of optical signals, with yet another that teaches channel detection and minimizing power loss to achieve Applicant's claim 1? Applicant asserts that he would not be motivated. Given that Alexander's technique doesn't suffer from the problems that Sakamoto and Meli address, the person of ordinary skill would not be led to try to improve Sakamoto and Meli's techniques with Alexander's teachings.

Second, the ways in which filters/optical couplers are utilized in the references are so different that the teachings provide no motivation for the person of ordinary skill to combine these references. Sakamoto appears to use filters/circulators to spectrally and directionally separate signals traveling in opposite directions onto separate paths in a bi-directional system. Meli, similar to Sakamoto, uses optical couplers to spectrally and directionally separate signals in a bi-directional system. Contrary to Sakamoto and Meli, Alexander does not disclose the use of filters for directional separation of signals traveling in opposite directions. Alexander uses thin film filters for spectral separation only. Specifically, Alexander discloses the use of several thin film filters to separate a plurality of multiplexed wavelength channels traveling in the same direction along two unidirectional paths into sub-groups of eight wavelength channels, which are demultiplexing and processed further. Again, how would the person of ordinary skill know to combine the teachings of Alexander with those of Sakamoto and Meli to achieve Applicant's claim 1? Again, Applicant asserts that he would not know, and that such motivation does not exist.

In the Office Action, the Examiner contends that one of ordinary skill in the art would be motivated to combine Alexander with the proposed Sakamoto and Meli combination, since Alexander suggests that using thin film filters introduces little power loss to sub-groups of channels. Applicant disagrees. The filters disclosed by Alexander are thin film filters, rather than the thin film wide-band filters used in Applicant's claimed invention. Alexander uses several thin film filters to separate sub-groups of wavelengths traveling in the same direction. In contrast, in each instance in which signal separation is needed, Applicant's

claimed invention uses a single thin film wide-band filter as the optimal solution for the problem of separating two large optical transmission bands of oppositely directed signals with low power loss. And, as known by those skilled in the art, the filter requirements for separating signals are more stringent for unidirectional signals than bi-directional signals. For example, Alexander states that the loss associated with the channels transmitted through the filtering elements is about 0.7 dB, as disclosed in column 5, lines 16-19. In contrast, Applicant's claimed invention includes a transmissive insertion loss in the range of 1.3 to 1.7 dB, as stated in claims 9 and 31. Therefore one of ordinary skill in the art would not be motivated to combine Alexander with the proposed Sakamoto and Meli combination to embody Applicant's claimed invention.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 103(a) rejection of claims 8, 9, 16 and 31.

Conclusion

In view of the remarks, Applicant submits that claims 1-9, 12-16, 18, and 21-31 are in condition for allowance, and reconsideration is therefore respectfully requested. If there are any outstanding issues that the Examiner feels may be resolved by way of a telephone conference, the Examiner is invited to contact the undersigned to resolve the issues.

Respectfully submitted,

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Atts.

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Date 7/20/04